

## Ablative Ceramic Foam Based TPS, Phase I

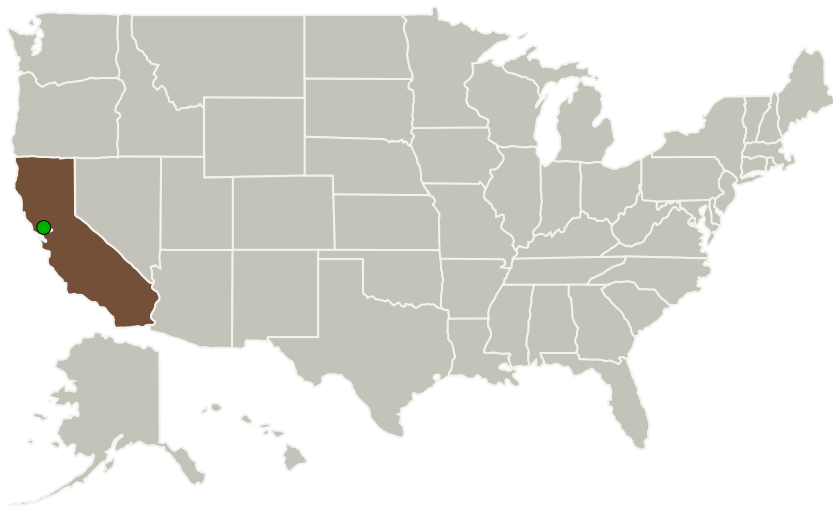
Completed Technology Project (2013 - 2013)



## Project Introduction

A novel composite material ablative TPS for planetary vehicles that can survive a dual heating exposure is proposed. NextGen's TPS concept is a bi-layer functional composite. The top ablative layer is a two polymer composite layer formed in a conformal shape by infiltrating ablative polymer in a Si based polymeric foam with controlled pore size distribution. This layer is for the aerocapture portion of the mission. Underneath it is a ceramic foam core sandwiched between a top ceramic ply and the bottom structural laminated composite substrate. This layer is for the entry portion of the mission. The Si based polymer foam core is similar to the top layer but is already pyrolyzed and is not infiltrated with ablative polymer. The proposed TPS when subjected to aerodynamic heating at high integrated heat loads the foam polymer structure pyrolyzes to the high temperature structure and the filled phenolic or epoxy resin will be charred and ablated. The TPS will be designed to minimize areal density while meeting bondline temperature and ablation rate requirements. The proposed TPS is easy to fabricate in aerodynamic body conformal shapes by simple manufacturing steps. The basis for the proposed concept is recent successful TPS development work performed by NextGen Aeronautics and the University of Washington under the Air Force program.

## Primary U.S. Work Locations and Key Partners



Ablative Ceramic Foam Based TPS

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

## Ablative Ceramic Foam Based TPS, Phase I

Completed Technology Project (2013 - 2013)



Organizations Performing Work	Role	Type	Location
NextGen Aeronautics, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Torrance, California
● Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

## Primary U.S. Work Locations

California

## Project Transitions

**May 2013:** Project Start**November 2013:** Closed out

## Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137937>)

## Images



## Project Image

Ablative Ceramic Foam Based TPS  
(<https://techport.nasa.gov/image/132975>)

## Organizational Responsibility

## Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

## Lead Organization:

NextGen Aeronautics, Inc.

## Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

## Program Director:

Jason L Kessler

## Program Manager:

Carlos Torrez

## Principal Investigator:

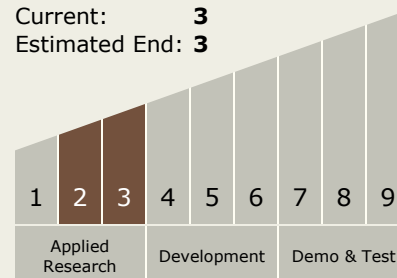
Shiv Joshi

## Technology Maturity (TRL)

Start: 2

Current: 3

Estimated End: 3



## Ablative Ceramic Foam Based TPS, Phase I

Completed Technology Project (2013 - 2013)



### Technology Areas

#### Primary:

- TX09 Entry, Descent, and Landing
  - └ TX09.1 Aeroassist and Atmospheric Entry
    - └ TX09.1.1 Thermal Protection Systems

### Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System